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INSTITUTE OF GAS TECHNOLOGY

THE GAS INDUSTRY'S OWN EDUCATIONAL AND RESEARCH FACILITY

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GAS ABSTRACTS

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1. GAS INDUSTRY

Fuel Competition

Shomaker, W. L. NATURAL GAS IS STILL THE BEST BUY. *Public Utilities Fortn.*, 56, 635-41 (1955) October 13.

A summary of the relative costs of coal, fuel oil, and natural gas together with some of the reasons why the natural gas companies have been able to keep their product such a bargain.

R. S. Walters

Industry Unity

Banks, F. M. WANTED: INDUSTRY COORDINATION. *Gas Age*, 116, 28-29, 32 (1955) October 20.

Although the natural gas industry is composed of three separate and distinct functions, all are affected by the public interest. There must be a meeting ground for all producers, pipe lines and distributors. Author's Abstract

Management Training

Institution of Gas Engineers. EDUCATION AND TRAINING IN THE GAS INDUSTRY. International Gas Union Paper IGU/9-55 6th Conference, New York. September 26-30 (1955); *Gas World* (British) 142, 830-34 (1955) October 1.

The means by which companies and associations on the continent train people for management at all levels is reviewed. This includes operation, foremen, salesmen, home service advisers and gas engineers. R. T. Ellington

Northwest Gas Market

Ebdon, J. F. NATURAL GAS FOR THE PACIFIC NORTHWEST. *Gas*, 31, 67-77 (1955) October.

A study of the potential market and description of operating characteristics of the distribution companies in the Pacific Northwest area of the United States. The work being done by the area's gas distribution companies to prepare for the arrival of natural gas is portrayed.

Publisher's Abstract

Rate Complaint Racket

FLORIDA STATE COMMISSION EXPOSES PROFESSIONAL RATE AGITATION RACKET. *Gas* 31, 11 & 12 (1955) November.

In a recent case tried before the Florida utility commission, a complaint alleging that the rates of Florida Power & Light Co. were unreasonable, excessive, arbitrary, and discriminatory, and seeking a rate reduction, was dismissed because it was a subterfuge used by professional rate agitators. This was champerty, which is condemned by law. A regulatory expert analyzes this situation and its effects on such matters in the future. Publisher's Abstract

Regulation of Sales

Douglas, P. H. FEDERAL REGULATION OF INDEPENDENT NATURAL GAS PRODUCERS IS ESSENTIAL. *Public Utilities Fortn.*, 56, 622-34 (1955) October 13.

The Senator from Illinois is opposed to relaxation of regulation by the Federal Power Commission over the independent nontransporting producer's sales of natural gas for resale. Competition cannot be relied upon to protect the consumer, as the industry is not really competitive at the production, transmission, or distribution levels. (In 1953, only 629 producers, 14.4% of 4,365 total, sold 97.9% of the total volume purchased by pipelines). Large pipelines, requiring large blocks of reserves, must accept the prices dictated by major producers, and the escalation clauses inserted in the gas contracts. Consumers, with $10 billion invested in gas appliances, cannot economically "convert" to other fuels. The Fullbright and Harris bills, which tend to nullify the Natural Gas Act, should not be passed by Congress.

O. P. Brysch

2. APPLIANCES

Air Conditioning

Ourusoff, L. A. G. A. AIR CONDITIONING RESEARCH PROGRAM. *Amer. Gas Assoc. Monthly*, 37, 6, 8 (1955) September.

The chairman of the AGA Task Group on Air Conditioning presents the Association's plan to expedite research in this field, and tabulates the relative first and operating costs of the cycles now under consideration.

R. T. Ellington

FIELD TEST NEW AIR CONDITIONER. *Amer. Gas Assoc. Monthly*, 37, 15, 37, 38 (1955) October.

The new experimental Servel 3-ton single-coil

all year gas air conditioner called the x FC-96-G, is being placed for a nation-wide field test. This is a smaller, lighter version of the present Servel absorption-type unit.

J. R. Hasenberg

Appliance Service Training

CON-ED'S NEW CENTERS OFFER TRAINING FOR SERVICEMEN IN ALLIED TRADES. *Gas*, 31, 65 (1955) November.

The articles describe the policy and facilities behind a program built around two new service centers where instruction will be given in gas appliance installation and servicing to personnel of appliance distributors, dealers, plumbing contractors, and servicing agencies.

Publisher's Abstract

Gas vs. Electric Cooking

Comm. on Comparison of Competitive Services Amer. Gas Assoc. WHAT'S THE SCORE? COSTS OF GAS VERSUS ELECTRICITY IN COMMERCIAL KITCHENS. Amer. Gas Assoc., New York (1955).

The results of comparative tests in commercial kitchens are presented in the form of a table giving the cost if electricity had been used instead of gas. It is based on the equivalence of 5.49 therms and 100 killowatt hours in commercial kitchen use. S. A. Weil

High Pressure Hot Water

Lieberg, O. S. HIGH TEMPERATURE WATER. PART I. BASIC ELEMENTS. *Air Conditng, Heatg Ventiltg*, 52, 84-97 (1955) September.

Under modern conditions, it is essential to generate heat efficiently and to distribute it economically. Costly research to improve boiler plant and new and efficient designs for combustion units can be nullified to a great extent when the heat so efficiently produced is inefficiently distributed and used. One of the most practical developments in heat generation, distribution and utilization, is high temperature water, or high pressure hot water, generated and distributed at 55 to 350 psi and 250 to 430° F. Author's Abstract

House-Piping Standards

RECOMMENDED PIPING ON INDUSTRIAL PREMISES. *Ind. Gas*, 34, 6-9 (1955) September.

The AGA recommended practices for installation of consumer-owned gas piping are presented. Pipe capacity tables are given for flow at pressures up to 20 psig. R. T. Ellington

3. COMBUSTION AND INDUSTRIAL FURNACES

Cyclone Furnace

Sifrin, A. (assigned to The Babcock and Wilcox Co.) HORIZONTAL CYCLONE FURNACE. U. S. 2,717,563 (1955) September 13.

Pulverized coal and primary air are introduced tangentially into the combustion chamber of this horizontal furnace which operates at temperatures above the ash fusion temperature of the fuel. Furnace walls are lined with water tubes and provision is made for control of secondary air by recirculating a portion of the combustion gases. E. J. Pyrcioch

Engine Detonation

Cramer, F. R. PANIC BUTTON CONDITIONS SCAVENGING AIR. *Pipe Line News*, 27, 35-38 (1955) September; FIGHTING DETONATION WITH CONDITIONED, SCAVENGED AIR *Gas*, 31, 128-30, 132, 134 (1955) September.

A report of experience in preventing detonation in large two-cycle gas engines by the addition of moisture to the scavenging air. It was found that moisture addition could be used to prevent detonation and that such addition promises fuel economies even where the detonation problem is not serious.

R. F. Bukacek

Explosibility

Shaw, J. F. A GRAPHIC METHOD OF DETERMINING THE EXPLOSIBILITY CHARACTERISTICS OF MINE-FIRE ATMOSPHERES. U. S. Bur. Mines Bull. 551 (1955).

Nomographs are presented that permit the determination of the flammability of mine-fire atmospheres when the composition is known.

S. A. Weil

Zabetakis, M. G. and Jones, G. W. THE PREVENTION OF INDUSTRIAL GAS EXPLOSION DISASTERS. *Chem. Eng. Progress*, 51, 411-14 (1955) September.

A review of recent data gathered by the Bureau of Mines on flammable limits of hydrocarbons in air. Methods of diluting with inerts to prevent explosive mixtures is discussed. Several safety practices are outlined.

W. G. Bair

Flame Research

Grumer, J., Harris, M. E., and Schultz, H. FLAME-STABILITY LIMITS OF ETHYLENE, PROPANE, METHANE, HYDROGEN, AND NITROGEN MIXTURES. *Ind. Eng. Chem.*, 47, 1760-67 (1955) September.

Mixing rules are presented for the prediction of flashback and blowoff limits of multi-component fuels using knowledge of these limits of pure and binary fuels through the use of the critical boundary velocity gradient concept. Comparison of calculated and experimental values differ by as much as 20% for flashback and 50% for blowoff with respect to permissible heat input. S. A. Weil

Simmons, R. F. and Wolfhard, H. G. THE INFLUENCE OF METHYL BROMIDE ON FLAMES. PART I-PRE-MIXED FLAMES. *Faraday Soc. Trans.* (British) 51, 1211-17 (1955) September.

The influence of methyl bromide and bromine on pre-mixed flames has been investigated. In contrast to the dilution effect of inert gases these compounds act as chemical inhibitors. The most significant change in pre-mixed flames on adding methyl bromide or bromine is that the limit temperature is raised. Limits of inflammability cannot be described by Le Chateliers' rule. The action of methyl bromide on flames can be interpreted in terms of the addition of equivalent amounts of fuel and bromine.

Authors' Abstract

Fume Oxidation

Uhleen, A. E. and Hayes, C. T. AIR POLLUTION K. O'D. *Instrumentation*, 8, (1955) Third Quarter.

The installation and operation of a catalytic oxidation unit to remove solvent fumes from the exhaust of an enamel strip baking oven is described. Fuel cost reduction and increased production as well as the elimination of air pollution was attained. D. V. Kniebes

Heat Exchange Economy

Sturges, P. M. SMART REFRIGERATION HOOKUP SLASHES PLANT WATER-HEATING COSTS. *Power*, 99, 122-23 (1955) September.

By use of a coil in a water-heater tank as part of the condenser surface in a freon refrigeration cycle, fuel is saved in water heating.

R. T. Ellington

Ignition

King, R. O., Sandler, S., and Strom, R. THE OXIDATION, DECOMPOSITION, IGNITION, AND DETONATION OF FUEL VAPORS AND GASES. XXVI. THE EFFECT OF FLOW CONFIGURATION ON THE OXIDATION AND IGNITION OF HYDROGEN IN MIXTURES WITH AIR SUPPLIED TO VERTICAL COMBUSTION TUBES OF VARIOUS MATERIALS. *Can. J. Techn.*, 33, 388-407 (1955) September.

Apparent ignition temperatures were determined for hydrogen-air mixtures by passing the mixtures through a heated tube. Over the length of the tube the temperature varied 200-300° C. The maximum temperature along the tube when ignition occurred was defined as the apparent ignition temperature. It was found to depend on the nature of the tube surface and the flow rates. At low flow rates where heat convection was important, the highest temperatures were necessary. As the flow was increased until turbulent conditions were attained, in the turbulent region, ignition temperatures increased very slowly with increased flow rates.

S. A. Weil

Shu, N. W. and Bardwell, J. TEMPERATURE COEFFICIENTS IN HYDROCARBON OXIDATION. *Can. J. Chemistry*, 33, 1415-25 (1955) September.

The rate of oxidation of methane in equimolar oxygen-butane mixtures was studied in the temperature range 260° C. — 540° C. The rate of pressure increase was used as a measure of the reaction rate. As a function of temperature, the rate has a maximum near 350° C. and

a minimum near 450° C. Through the use of simplifying assumptions, the authors calculate the rates of chain initiation and chain branching. The large energy of activation of the oxidation at the lower temperatures is found to depend on the chain initiation reaction step. The negative temperature coefficient is attributed to a change in mechanism from one involving peroxides. S. A. Weil

Industrial Heating

Rappolt, H. G. METAL FINISH BAKING WITH GAS RADIANT AND CONVECTION. International Gas Union Paper IGU/18-55 6th Conference, New York, (1955) Sept. 26-30.

The author discusses the relative merits of low and high temperature radiant panels and convective heat transfer for paint drying.

R. T. Ellington

Metallurgical Heating

NEW PROCESS HEATS DIE BLOCKS 4 TIMES FASTER. *Ind. Gas*, 34, 10-11 (1955) September; *Ind. Heating*, 22, 2264, 6, 8, 70 (1955) November.

The application of rapid radiant heating to large die blocks of crack-sensitive steel is described. Load cycles have been shortened from 20 to 30 hrs to 3 to 4 hrs with a fuel savings of 20% per pound of metal treated.

R. T. Ellington

Outdoor Radiant Heater

PERFECTION HEATER USED INDOORS OR OUT. *Can. Gas J.*, 48, 21 (1955) September.

A brief description is given of the use of the Schwank type burner in radiant heaters for large enclosures on out-door installations and a photograph is presented of a drive-in restaurant installation. R. T. Ellington

4. CARBONIZATION AND GASIFICATION

Accidents

Battersby, T. C. and Braunholtz, W. T. UNUSUAL INCIDENTS AT GAS WORKS AND THEIR LESSONS. (PART II). Inst. Gas Eng. (British) Commun. No. 451 (1954) September 28.

The booklet gives examples of unusual accidents in British gas works and preventive means that are employed. Explosions in retort-house and water gas plants, purifiers, mains, detarrer, as well as accidents in storage, electrical, boiler and handling equipment are described.

W. G. Bair

Catalytic Reformer

King, G. R. INSTALL MODERN CATALYTIC REFORMERS. *Amer. Gas Assoc. Monthly*, 37, 33-36 (1955) September.

The Girdler continuous catalytic reforming process installation at the West Conshohocken gas plant of the Philadelphia Electric Company to produce a high-hydrogen gas is described.

H. A. Dirksen

Coal & Shale Pyrolysis

Prien, C. H. PYROLYSIS OF COAL AND SHALE. *Ind. Eng. Chem.*, 47, 1911-15 (1955) September.

This eighth review of coal and shale pyrolysis discusses 66 of the most significant contributions. Mechanisms of coal oxidation and of the coking process, as well as processes and equipment for high and low temperature carbonization are treated. In oil shale work, the Bureau of Mines—Univ. Wyoming Conference of August 1954 is specially cited, and more concerted effort is recommended on the fundamental nature of oil shale. Patents on new techniques in fluidized retorting of shale oil, and papers on shale oil refining and products are discussed.

O. P. Brysch

Coal Constitution

Berkowitz, N. PHYSICOCHEMICAL STUDIES ON ALBERTA COALS. II. ON THE PHYSICAL BEHAVIOR OF COAL IN ULTRASONIC FIELDS. *Can. J. Techn.*, 33, 378-87 (1955) September.

Results of the exploratory tests designed to test the response of coal to ultrasonic irradiation at 250 kc./sec. and 1 Mc./sec. indicate an essentially stable structure at these frequencies, while limited changes are induced in the X-ray pattern and colloid structure of the coal. The density of the coal, however is unaffected and no 'cavitation' and macroscopic breakdown has been offered. Calculations of the energetics of radiations indicate that ca. 99% of the theoretically available input energy is elastically reflected. K. C. Channabasappa

Brown, J. K. and Wyss, W. F. OXYGEN GROUPS IN BRIGHT COALS. *Chem. and Ind.* (British), No. 36, 1118 (1955) September 3.

Infra-red studies of acetylations and solvent extracts of coals have shown that the elemental oxygen in coal is present in hydrogen-bonded phenolic hydroxyl groups. Similar indications have been obtained from the study of the polargraphic behavior of coal extracts in dimethyl formamide with lithium chloride as a supporting electrolyte. K. C. Channabasappa

Coal Gasification

Gagnaire, L. COMPLETE GASIFICATION OF CAKING COALS. International Conference on Complete Gasification of Mined Coal, Liege, Belgium, May 3-8, 1954, Inichar; p. 161-8.

Design and operating results are presented for an industrial gaseous fuel producer plant at Le Creusot, France, in which caking coals are gasified. The plant has a design capacity of 100 tons per day and has operated successfully with a thermal efficiency of 90 per cent using high-volatile coals from Lorraine. Costs, including operating and capital charges, for a therm of gas are estimated at 1.3 times the cost of a therm of coal. E. J. Pyrcioch

Newman, L. L. DEVELOPMENTS IN THE OXYGEN GASIFICATION OF SOLID FUELS ON THE AMERICAN CONTINENT. International Conference on Complete Gasification of Mined Coal, Liege, Belgium, May 3-8, 1954; Inichar; p 48-64.

The use of oxygen for the gasification of coals and other solid fuels in experimental and commercial units in the United States and Canada is reviewed. Developments of the past 30 years are traced with descriptions of early attempts at producer gas generation using oxygen and steam blasts in fixed fuel beds. A discussion is given of the recent work of the Institute of Gas Technology and the Bureau of Mines on high pressure gasification of pulverized coal in suspension with oxygen and steam for synthesis gas production. E. J. Pyrcioch

Nelson, H. W. PROBLEMS OF CAKING IN THE COMPLETE GASIFICATION OF BITUMINOUS COALS. International Conference on Complete Gasification of Mined Coal, Liege, Belgium, May 3-8, 1954, Inichar; p 86-95.

The behavior of caking bituminous coals in fixed-bed gas producers of various designs is described in this study. It is known that the caking of coal limits the rates of gasification and the over-all efficiencies in fixed-bed processes. Reviewed in this paper are certain decaking methods such as mechanical agitation, oxidation and thermal threatment. According to investigations at Battelle Memorial Institute, fluid-bed gasification using the Flesch-Winkler cyclic process was only partially successful as a solution to the caking problem. More successful results were obtained with the preoxidation of coal with air in a fixed bed to destroy the caking properties of the coal and eliminate coke formation. E. J. Pyrcioch

Coal Preparation

Parker, A. THE PRE-TREATMENT OF COAL BEFORE CARBONISATION. International Gas Union IGU/23-55 6th Conference New York, September 26-30 (1955); *Gas World* (British) 142 838-41, 844-47 (1955) Oct. 1.

The paper deals first with the characteristics required in coals for the production of coke and gas by carbonisation at different temperatures in plants of several types. With the shortage of gas coals and coking coals in many areas, it is necessary to use coals of other types in place of or to supplement high-grade caking coals. Pre-treatment of the coals is often necessary, by such methods as coal cleaning, drying, oxidation, pre-heating, size-grading and grinding, blending, and briquetting. The factors involved in these methods of pre-treatment are discussed and exemplified by descriptions of methods and processes of various kinds that have been applied, or investigated on an experimental scale. Author's Abstract

Coke Desulfurization

Gorin, E. and Zielke, C. W. (assigned to Pittsburgh Consolidation Coal Co.) DESULFURIZATION OF LOW TEMPERATURE CARBONIZATION CHAR. U. S. 2,717,868 (1955) September 13.

High-sulfur char from a low-temperature (800°-1200° F.) carbonization process is de-

sulfurized by contacting a bed of char, at 1100°-1700°, with a gas mixture free of H2S and containing hydrogen and methane, under a pressure of 5 to 15 atmospheres, for 10 to 100 minutes. Hydrogen sulfide-free gas from coke ovens, or from a subsequent char devolatization stage may be used, preferably with an H_2:CH_4 volume ratio of 0.15 to avoid loss of carbon by gasification. O. P. Brysch

Coke + CO_2 Reaction

Dahme, A. and Junker, H. J. DIE REAKTIVITAET VON KOKS GEGEN CO_2 IM TEMPERATURBEREICH 1000-1200° C (THE REACTIVITY OF COKE WITH CO_2 IN THE TEMPERATURE RANGE 1000-1200° C.) *Brennstoff-Chemie* (German) 36, 193-203 (1955) July 13.

The reaction-velocity constant and the energy of activation were determined for the reaction of fine-grained coke and carbon dioxide for the temperature range of 1000° to 1200° C. Relative surface area measurements were made on the partially gasified coke particles.

E. J. Pyrcioch

Coking Test Methods

Düwel, G. EXPERIENCE GATHERED BY THE APPLICATION OF VARIOUS TEST METHODS FOR THE DETERMINATION OF THE COKING PROPERTIES OF COAL. International Gas Union Paper IGU/13-55 6th Conference New York, September 26-30 (1955): *Gas J.* (British) 284, 119-22, 136 (1955) Oct. 12; *Gas World* (British), 142 (Coking Sect.) 99-102, 4, 6, 7, (1955) November 3.

The several laboratory and pilot coking tests used by the Hamburg Gas Works are described as an example of the procedures needed for selection of coals. Since the coke produced by these gas ovens must be of saleable quality, its required chemical and physical properties must be related to the coals or blends by means of these tests and plant experience. Coking still (assay), box coking tests, plastometric tests and Foxwell gas-flow test methods are briefly described. Relation of the Micum tumbler-hardness of cokes to the moisture, coal-particle size and volatile content are illustrated. The laboratory methods are useful but are not directly related to plant results so as to permit predictions for coals in general. O. P. Brysch

Ulrich, F. BETRACHTUNGEN UEBER UNTERSUCHUNGS-METHODEN ZUR KENNTNIS DES VERKOKUNGSVERMOEGENS VON KOHLEN. (INSPECTION OF RESEARCH METHODS FOR INFORMATION ON THE COKING POWER OF COALS). *Gas- und Wasserfach* (German), 96, 557-60 (1955) September 1.

A series of coals of various size compositions were investigated to determine the significance of the several research methods on cokability of coals and blends, and on cokes therefrom. Tumbler tests were used on the cokes (from a 130- to 150-kg test-oven), and the Koppers expansion test, dilatometer, and swelling index are used on coals and blends. The results were graphed against blend-composition and volatile matter. The author concludes from wide scattering of the test data, that the pulverization of the coal charge has more significance in the resulting coke strength than the results of the three laboratory coking tests. O. P. Brysch

Ferrocoke Economy

Paschke, M. THE COMPLETE GASIFICATION OF GAS COAL IN SHAFT-FURNACES WITH INTERMEDIARY CONVERSION INTO FERRO-COKE: ITS IMPORTANCE FOR THE GAS AND METALLURGICAL INDUSTRIES. International Conference on Complete Gasification, Liege (Belgium) 202-10 May 3-8 (1954).

Two materials, gas coal and fine iron ores, little suited for smelting in shaft furnaces, can be made into ferrocoke in regular coke ovens. Using ferrocoke with up to 40% iron content, the Thyssen Gas- und Wasserwerke and the Bergwerkeges. Walsum m. b. H. have successfully produced iron in small shaft-furnaces, and with mixtures of regular coke, in larger furnaces. Good yields of furnace gas, up to 120 Btu per CF also are obtained, which when used to heat the coke-ovens, will add to the gas supply of Germany by releasing the rich oven-gas as surplus. O. P. Brysch

French Gas Techniques

Delsol, R. EVOLUTION OF GAS PRODUCTION TECHNIQUES IN FRANCE. International Gas Union Paper IGU/21-55, 6th Conference, New York, September 26-30 (1955). Although based on the long-established coal

carbonizing industry, the gas manufacturing industry of France has been forced to adopt new processes of gasification by the economic conditions and increased demands. New coke ovens at Paris, Rouen and in Lorraine have been added, the latter gas being gathered from 12 metallurgical plants and sent by a new 300-mile pipe line to Paris. Cracking of heavy oils (*O.C.C.R., BIANCHI, ONIA-GEGI, HALL, GEIM, GASMACO,* and *THERMOFOR* processes), and reforming of natural gas (*HERCULES, CARBOFAX, STARK, KOPPERS-HASCHE* processes) as applied on commercial and experimental gas making are discussed. Propane-airgas and the southwestern natural gas are mentioned. References (34) are cited, and 9 tables of oil-gas properties are given.

O. P. Brysch

Gas Coal Tests

Renaudie, M. and Pirou, G. DEVELOPMENT OF APPARATUS FOR THE SELECTION, UNDER LABORATORY CONDITIONS, OF COALS FOR USE IN COMPLETE GASIFICATION PLANT. International Conference on Complete Gasification, Liège (Belgium) 294-300, May 3-8 (1954).

To detect the highly swelling and aglomerating coals, which would upset the operation of the complete gasification plants ("G.I." at Vierzon and Tully at Chambéry), the authors devised an empirical test method of the dilatometer type for study of the expansion of the charge during sweep-heating by direct contact of flue gas. A 1400-gram charge of 3-5 mm coal in a vertical 80-mm diam steel tube, or a 900-gram charge in a 60-mm sheet steel expandible tube, were heated at about 0.5° C. per min by 600° C. flue gases to attain a final temperature of 600° C. in 1 hour. Radial swelling was measurable by the degree of opening of the expandible tube. Axial (vertical) swelling was measured by increase in axial length of charge. The latter is more characteristic, but appearance of agglomerated semi-coke was also a valuable index. The method has not been correlated completely with industrial or with usual swelling-index results.

O. P. Brysch

Hydrocarbon Gasification

Bearer, L. C. (assigned to Phillips Petroleum Co.) MEANS AND METHOD FOR PRODUCING FUEL GAS. U. S. 2,714,059 (1955) July 26.

The patent outlines a process and equipment for producing a fuel gas (water gas) from C_3 and C_4 paraffins. The equipment consists of a conventional pebble heater.

W. G. Bair

Stark, V. PROCESS OF TREATING OIL GAS TO PRODUCE UTILITY GAS OF LOW HEAT CONTENT AND LOW GRAVITY WITH VALUABLE BY-PRODUCTS. U. S. 2,714,060 (1955) July 26.

The process described is thermal cracking of gas oil or residual oils to produce oil gas. Subsequent processing of the gaseous or liquid products by compression, absorption and low and high temperature fractionation will yield any desired gaseous products of a given heating value and gravity, and other byproducts.

W. G. Bair

H_2S Removal

Moignard, L. A. THE EFFICIENT OPERATION OF OXIDE PURIFIERS. International Gas Union IGU/24-55, 6th Conference, New York, September 26-30 (1955) *Gas World* (Brit.) 142, 816-18, 820-25 (1955) Oct. 1.

Results are presented of a study of hydrogen sulfide removal using iron oxide as currently practiced in British gas works together with laboratory studies on the mechanism of the dry purification process. The study was primarily concerned with hardening of the oxide in use. Operational methods are given for preventing the drying of the oxide and for maintaining activity. To attain increased operating efficiency, the purifiers are discussed as regards loading, heat dissipation and design.

E. J. Pyrcioch

Queret, Y. and Guillet, R. CHEMICAL PURIFICATION OF GAS AND SULFUR RECOVERY PROGRESS AND NEW APPLICATIONS. International Gas Union Paper IGU/22-55, 6th Conference, New York, September 26-30 (1955).

This paper reviews the various commercial units which have been and are being used for the removal of sulfur contained in gaseous fuels, along with several processes for sulfur recovery. Some of the new unit purification processes are only suitable for gases free of tar and organic

products. In these processes sulfur may be recovered directly or the hydrogen sulfide may be treated to obtain sulfuric acid by catalysis or sulfur by burning in Claus ovens. Ammonia purification is now used in France in the Cornillon coke oven plant where H_2S is treated by dry catalysts to give sulfuric acid for use in ammonium sulfate production. At the Carling coke oven plant gas is purified under pressure with carbonate. Ethanolamine purification is employed in the petroleum industry with burning of the H_2S to obtain sulfur.

E. J. Pyrcioch

Producer Gas Operation

Allan, G. W. PROGRESS REVIEW NO. 35: DEVELOPMENTS IN GAS-PRODUCER PRACTICE. *J. Inst. Fuel* (British), 28, 458-62 (1955) September.

A brief review is presented of certain developments in gas producer operation and design as regards improved performance and better quality gas. Discussed are fuel bed depths, the use of oxygen, the influences of coal types, gas cleaning and the use of producer gas for the firing of coke ovens. E. J. Pyrcioch

Semi-Coke Elasticity

Fitzgerald, D. AN APPARATUS FOR MEASURING THE VISCO-ELASTIC PROPERTIES OF COAL IN THE COURSE OF CARBONIZATION. *J. Sci. Instruments* (British), 32, 359-61 (1955) September.

The strain-time relationship of a coal briquet during later stages of carbonization may be determined by this new special instrument. Contraction rates measured during and after stressing by applied loads permit the measurement of viscosity and elasticity of the sample. So-called semi-coke is shown to retain residual flow properties, which would be of importance in the shrinkage and cracking of oven coke.

O. P. Brysch

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Coope, J. R. ORGANIC SULFUR PROCEDURE. p. 221

Pilcher, J. M. STEAM-CARBON KINETICS. p. 223

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Canadian Gas Line

NEW CANADIAN GAS PIPE LINE POLICY IS BEING DEVELOPED. *Pipe Line News*, 3, 14-16 (1955) July.

A discussion of the current status of natural gas in Canada. R. F. Bukacek

Carbon Black

Cines M. R. and Krejci, J. C. (assigned to Phillips Petroleum Co.) PROCESS OF PRODUCING INCREASED YIELDS OF TAR-FREE CARBON BLACK. U. S. 2,714,055 (1955) July 26.

The patent describes a carbon black process in which increased yields of carbon black obtained by using an excess of hydrocarbon in the initial combustion furnace and making a tarry carbon black then detarring the carbon black. W. G. Bair

Compression

Baird, R. C. COMPRESSOR PLANT ACOUSTICS. *Pipe Line News*, 3, 32-38 (1955) July.

A general description of noise in compressor plants; sources, characteristics and abatement methods. R. F. Bukacek

Conservative Products Plant

Compton, N. W. LOW-TEMPERATURE "DRY" GAS PLANT FOR DENVER-JULESBURG. *Oil Gas J.*, 54, 112-13 (1955) September 19.

The recently completed gas products plant of Continental Oil Co. et al. in Little Beaver field, Colorado, has practically no water consumption (2 to 5 bbl. per day). Five separate techniques are used to conserve water and to make the plant operate efficiently. Author's Abstract

Drilling

Magner, H. J. AIR-GAS, TOP TO BOTTOM. *Oil Gas J.*, 54, 183-84, 187, 190 (1955) September 26.

Air-gas drilling for surface hole, production-string hole, and gas completions in Pennsylvania are reviewed. (See also Gas Abs., 11, 197 (1955) November. Author's Abstract

Exploration

Hepburn, G. C., Jr. and Murphy, D. M. PROGRESS IN SIDE-WALL CORING. *Calif. Oil World*, 48, 2nd iss., 2, 5, 31 (1955) August.

Improvements in the tools coupled with the use of modern logging methods for determining sample point with pin-point accuracy, has greatly increased the effectiveness of this method of sampling subsurface formations. The side-wall method is faster and more economical than conventional coring methods. The scope of this technique is continually increasing.

B. E. Eakin

Martin, M. WITH THE MICROLOG YOU CAN BE SURE. PART I. *Oil Gas J.*, 54, 108-11 (1955) September 19.

The Microlog is very useful in formation evaluation because of its power to resolve the differences between adjacent thin beds. With the help of conventional logs and the Microcaliper, the Microlog can be used to differentiate between permeable and impermeable beds. This installment deals with the identification of different formations by the Microlog. The next part will show how the Microlog can be used to determine oil saturation and an index of producible oil. Author's Abstract

Hot Line Repair

Gavin, H. W. CONTROL FIRE METHOD FOR GAS PIPE LINE REPAIR. *Petroleum Eng.*, 27, D47-54 (1955) September.

The article describes the use of controlled gas bleed to maintain controlled fire through the job of cutting out and replacing 168 ft of 30-in. pipe. (See also *Gas Abs* 11, 199 (1955) November) R. T. Ellington

H_2S Removal

Updegraff, N. C. HOW TO SELECT EQUIPMENT TO PREVENT SOLUTION CARRY-OVER, REMOVE ACCUMULATED SLUDGE, PROVIDE FOR REGENERATION. *Petroleum Processing*, 10, 1396-99 (1955) September.

A survey of the Girbitol process (ethanol amine H_2S and CO_2 removal process) with definite suggestions for prevention of trouble spots in the process and equipment. W. G. Bair

Interchangeability

Anthes, J. F. RESEARCH ON INTERCHANGEABILITY OF FUEL GASES IN THE UNITED STATES. International Gas Union Paper IGU/19-55 6th Conference, New York (1955) September 26-30.

A very concise review is presented of interchangeability indices, the history of interchangeability studies and research on production of interchangeable gases.

R. T. Ellington

Leak Detection

Snyder, R. I. PRACTICES USED BY DISTRIBUTION AND TRANSMISSION COMPANIES FOR GAS LEAKAGE DETECTION. International Gas Union Paper IGU/17-55, 6th Conference, New York, September 26-30 (1955).

A summary of leakage detection practices of a representative group of companies associated with the International Gas Union as indicated by the results of a survey. Such topics as the nature of leakage, types of surveys, the formulation of a leak detection program and tests and procedures related to leakage are given general but broad coverage. A list of instruments used in connection with leakage surveys and a detailed summary of replies to questions asked in the survey are presented in an appendix.

G. G. Wilson

Line Safety Plan

Fisher, E. H. SUPER-INCH LINE FAILURE: LIMIT DOWNTIME TO 12 HOURS. *Pipe Line Industry*, 3, 26-31 (1955) September.

A description of the means taken to limit possible down-time due to line failure in Pacific Gas and Electric Company's 34-inch pipeline from Topock to Milpitas, California.

R. F. Bukacek

LP-Gas Drive

Hock, R. L. USE OF LIGHT HYDROCARBONS FOR BETTER OIL RECOVERY IN NORTH LOUISIANA. *Producers Monthly*, 19, 33, 34, 36-40 (1955) July.

A review is presented of the work in the last few years on secondary recovery methods using light hydrocarbons as the displacing fluid. The advantages of this method over others are out-

lined, and theoretical, model, and practical field studies are reported. The use of LP-gas for flooding also helps to stabilize the market for this product. B. E. Eakin

Main Capacity

McCafferty, D. W., Kroeger, C. V. HOW TO PREDICT GAS MAIN CAPACITY. *Amer. Gas J.*, 182, 14-15 (1955) September.

The validity of the rule of thumb that the effective capacity of an intermediate pressure pipeline is 80% when the pressure loss at the terminal point is 40 per cent of the initial absolute pressure is demonstrated graphically for the Weymouth equation. This rule of thumb is recommended for rapidly determining if mains are approaching capacity.

G. G. Wilson

Meter Servicing

Gilmore, E. R. TROUBLESHOOTING DISPLACEMENT METERS. *Pipe Line Ind.*, 3, 66, 68 (1955) September.

Hints are given on the proper adjustment of the various parts in a positive displacement meter to assure satisfactory trouble-free service. G. G. Wilson

Offshore Operations

Howe, R. J. DESIGN OF OFFSHORE DRILLING STRUCTURES. *Amer. Soc. Mech. Eng. Trans.*, 77, 827-51 (1955) August.

This paper presents a condensation of the published engineering information applicable to design of offshore drilling and producing structures. The wind and wave forces which act on offshore units are described in considerable detail, as are the soil reactions for the structure footings. Specific examples are discussed relative to the internal effects of deflection, stresses, and natural frequencies. The methods used for calculating the floating stability of mobile units are also included. General classifications of structure types are discussed giving relative advantages. B. E. Eakin

SPEEDY LAUNCHING OF SUBMARINE PIPE LINE. *World Petroleum*, 26, 106 (1955) September.

The use of 135 hp launches and fourteen large buoys to move 1¾ miles of 20″ pipe out to an off-shore loading station in the Persian Gulf is described. G. G. Wilson

Permeability Study

Hutta, J. J. and Griffiths, J. C. DIRECTIONAL PERMEABILITY OF SANDSTONES: A TEST OF TECHNIQUE. *Producers Monthly*, 19, 26-34 (1955) September.

Bedded rocks tend to exhibit well-marked directional permeability phenomena. Directional permeability and its relationship to dimensional orientation of grains within the sediment is the overall objective of which this research on the detailed testing of measuring technique is a part. This article covers sample preparation, equipment and procedure, experiment design and arrangement, and a description of the results. A series of directional permeability coregraphs are included, which provide a very excellent indication of permeability variations. The experiment was designed to utilize the statistical technique of analysis of variance by means of randomized block designs.

B. E. Eakin

Pipeline Cleaning

Hughen, P. L. INTERNAL CLEANING OF PIPE LINES IN OPERATION. *Pipe Line News*, 27, 27-31 (1955) August; ON-STREAM CLEANING OF GAS PIPELINES. *Oil Gas J.* 54, 116, 18, 20, 22 (1955) Oct. 3.

A report summarizing the experience of Texas Eastern Transmission Corp. with on-stream cleaning of pipelines. Diagrammatic sketches of scraper trap installation are presented with a description of operating procedures used and the results of on-stream cleaning covering the years 1947 to 1954 are presented.

R. F. Bukacek

Recommended Bevel

Strong, R. G. THE CASE FOR 37½° BEVEL IN PIPELINE WELDING. *Oil Gas J.*, 54, 123, 126-27 (1955) September 19.

The author says that the 37½° bevel is better than the 30° bevel for these reasons: 1) finished root-bead has better contour, giving better welding jobs; 2) results obtained in using both 30° and 37½° bevels on 2,000 miles of pipeline strongly favor the wider bevel; 3) broad recognition strongly recommends the wider bevel as an accepted standard.

Author's Abstract

Right-of-Way Costs

Roberts, A. L., Jr. PROBLEMS INVOLVED IN THE RELOCATION OF UTILITY FACILITIES UNDER THE NATIONAL HIGHWAY PROGRAM. *Public Utilities Fortn.*, **56**, 580-85 (1955) September 29.

A discussion is given on the problems of cost of the relocation of utilities facilities under the National Highway Program, along with an estimate of amounts that utilities will be required to spend without reimbursement. A study made by the Department of Commerce for the year 1953 shows that utilities spent $25,000,000 and that was when the federal budget for highways was only $550,000,000. The history and reasons why utilities use highway right-of-ways, the laws involved, and activities in the 84th Congress for bills to aid the utilities in the relocation of facilities are summarized.

J. R. Hasenberg

Station Noise Reduction

Neaves, C. MUFFLER, ACOUSTIC MATERIALS AID PRESSURE STATION NOISE ABATEMENT. *Petroleum Eng.*, **27**, D26-30 (1955) September.

The use of various methods of sound insulation to reduce the noise from a station with several large regulators operating in parallel is described.

R. T. Ellington

Volumetric Behavior

Buckingham, A. D. and Pople, J. A. THE STATISTICAL MECHANICS OF IMPERFECT POLAR GASES. PART I—SECOND VIRIAL COEFFICIENTS. *Faraday Soc., Trans*, (British), **51**, 1173-79 (1955) September.

This paper deals with the forces between polar molecules and their relation to gas imperfection. In addition to the interaction of permanent dipoles, other directional intermolecular forces, such as dipole-induced dipole interaction, quadrupole forces and the effect of molecular shape may be important. These are discussed quantitatively and intermolecular potentials proposed to allow for them. Detailed expressions for the corresponding second virial coefficients are obtained from statistical mechanics and applied to experimental data for some polar gases.

Authors' Abstract

Hamann, S. D., Lambert, J. A., and Thomas, R. B. THE SECOND VIRIAL COEFFICIENTS OF SOME GAS MIXTURES. *Australian J. Chem.*, **8**, 149-157 (1955) May.

A series of low pressure compressibility measurements were made on CH_4, CH_4 and $C(CH_3)_4$, CH_4 and $Si(CH_3)_4$, and CH_4 and SF_6. The values of the second virial coefficients derived from these results failed to agree with the existing theories of the extension of the law of corresponding states. A discussion of the probable reasons for this discrepancy is presented.

B. E. Eakin

Hobson, M. and Weber, J. H. PREDICTING VOLUMETRIC BEHAVIOR. *Petroleum Processing*, **10**, 1143-54 (1955) August.

The method of Kay, using pseudo-reduced properties and a generalized compressibility factor, is compared with the equations of state of van der Waals and of Wohl, for calculating the volumetric behavior of gaseous hydrocarbon mixtures. The comparison indicates that an equation of state method is frequently of greater accuracy, especially if used over limited pressure ranges.

B. E. Eakin

Well Fire

BIGGEST GAS WELL FIRE IN EAST NEAR FAMED LEIDY FIELD. *Producers Monthly*, **19**, 10-15 (1955) July.

A pictorial record of the New York State Natural Gas Corporation's gaswell fire. The well was being drilled by rotary rig with air circulation, and when the productive formation was penetrated the well went wild and ignited. The damages were estimated as between $75,000 to $100,000. The well is rated at 150 to 200 MMCF open flow.

B. E. Eakin

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Desulfurization

Klinkert, H. G. and Penning, H. M. SHELL "TRICKLIE" HYDRODESULFURIZER. *Petroleum Ref.*, **34**, 153-54 (1955) September.

The operation of the first commercial unit of the Shell trickle hydrodesulfurization process at the Stanlow Refinery in England is described. Feedstocks processed in this 7000 barrel per day unit are lightly catalytically-cracked cycle oil and mixtures with heavy strength-run gas oil

both of Middle East origin. A multi-bed reactor with a cobalt molybdenum on alumina catalyst is used, with cooling oil injected between the catalyst beds for temperature control. More than 90 percent of the sulfur had been hydrogenated in both feedstocks. No decrease in catalytic activity was noted after two months of operation. E. J. Pyrcioch

Nicholson, E. W. (assigned to Esso Research and Eng. Co.) HYDRODESULFURIZATION OF HEAVY OILS. U. S. 2,717,855 (1955) September 13.

Crude residua are deashed by preheating and heat soaking to agglomerate the ash-forming constituents which otherwise would precipitate upon and rapidly deactivate a desulfuring action catalyst. Following this treatment the stock may be filtered and fed to a sump-phase hydrogenation unit, or preferably, may be fed to such a unit without filtering if the catalyst is an expendable one. D. M. Mason

Odasz, F. B., Sheffield, J. V. DIESULFORMING OPERATES THIS WAY. *Petroleum Ref.*, 34, 158-63 (1955) September.

Data is presented from the operation of a common 1000-bbl per day diesel oil desulfurization unit at the Cody, Wyoming refinery of the Husky Oil Co. In this process high sulfur content distillates in the diesel oil boiling range react with hydrogen from a reformer in a fixed bed catalytic reactor to produce a low sulfur hydrocarbon and hydrogen sulfide. Operating pressure of the unit is 450-550 psig and the inlet temperature for the feed is not over 800° F. E. J. Pyrcioch

Fuel Oil Handling

Elonka, S. YOU MUST KNOW *HOW* TO HEAT RESIDUAL FUEL OIL. *Power*, 99, 110-11 (1955) August.

A general discussion is presented on methods of heating the suction and transfer lines for heavy fuel oil. "Rule of thumb" data on temperature levels is also presented.

W. G. Bair

H_2S Extraction

Wylie, R. (assigned to Esso Research and Eng. Co.) RECOVERY OF ACIDIC GASES. U. S. 2,718,454 (1955) September 20.

Improved operation of the ethanol amine process for recovering acid gases from liquid hydrocarbons such as propane is obtained by adding the amine from 0.1 to 10% of an alkali metal compound such as sodium hydroxide, sodium sulfide, or sodium carbonate. The capacity of the amine is increased by such addition and a higher charging rate can be maintained with the same amine circulation rate. Reduction of amine loss is a further improvement.

D. M. Mason

Oil Properties

Waterman, H. J. DIE BEDEUTUNG DER GRAPHISCH - STATISTISCHEN ANALYSE FUER DIE ERFORSCHUNG DER MINERALOELE. (THE SIGNIFICANCE OF GRAPHICAL-STATISTICAL ANALYSIS IN MINERAL OILS RESEARCH.) *Brennstoff-Chemie* (German), 36, 169-176 (1955) June 1.

A review is given over the development of graphical-statistical methods which have found application over the last 25 years in different fields of applied chemistry in the laboratories of the Delft Technische Hochschule. This is shown particularly in the analysis of mixtures of analogous materials. Especially applicable are the physical constants, such as refractive index, density, mean molecular weight, dispersion, surface tension, magneto-optical rotation, viscosity, temperature dependence of certain physical constants, functions such as specific refraction and specific parachors. For example selective adsorption or extraction, fractional or molecular distillation and thermal diffusion are applied for separation of hydrocarbon mixtures into fractions of different characters. Special methods of graphical preparation enable the quick attainment of an insight into different chemical processes, for example in refining as in hydrogenation, polymerization, and hydrofining, diagrams evaluating the thermodynamic units such as free enthalpy of formation will be given for organic sulfur components and their conversion. Besides the n-d-M-methods for the rapid analysis of hydrocarbon mixtures, a new method utilizing viscosity, refractive index and density is explained completely.

Author's Abstract

7. ANALYTICAL METHODS AND TESTS

Acid Gas in Oils

Riggin, D. M. and Kendrick, C. L. ANALYZE RESERVOIR FLUIDS FOR ACID GAS AND FOR HYDROCARBONS AT SAME TIME. *Oil Gas J.*, 54, 119-20 (1955) September 19.

A method is presented whereby the weights of the CO_2 and H_2S which are removed from the sample charged to low temperature fractional distillation analysis are obtained by weighing the solid absorption reagents. The percents of CO_2 and H_2S are calculated from the respective weights and from the volume of gas charged. Apparatus and method for application to samples containing non-volatile hydrocarbons are presented. D. M. Mason

Adsorption Analysis

Clough, K. H. ANALYSIS OF GASEOUS MIXTURES WITH A NEW UNIT. *Petroleum Eng.*, 27, C26, 29-31 (1955) September.

The "Fracton", an apparatus for analysis of gaseous hydrocarbon mixtures by adsorption on activated charcoal, is described. A sample of 300 to 350 ml of gas is ordinarily used. Separated fractions are identified by thermal conductivity, the amount of each measured automatically, and the information recorded on a chart. Operation of the equipment is discussed and typical analysis of natural gas, propane-butane, and natural gasoline are shown.

D. M. Mason

Coke Sampling

Mott, R. A. and Turner, R. W. THE SIZE-REDUCTION AND SAMPLE-DIVISION OF THE MOISTURE SAMPLE OF COKE FOR GENERAL ANALYSIS. *Gas World* (British) Coking Sect. Suppl., 142, 31-38, 40 (1955) August 6.

A detailed account is presented of the sources of error in the reduction of coke samples and of the methods devised in the British Coke Research Association to reduce these errors. Data on variance of analyses, laboratory mixing, sample dividing, mechanical crushing, and contamination are discussed and proper procedures are recommended. O. P. Brysch

Dissolved Oxygen

Buchoff, L. S., Ingber, N. M., and Brady, J. H. COLORIMETRIC DETERMINATION OF LOW CONCENTRATIONS OF DISSOLVED OXYGEN IN WATER. *Anal. Chem.*, 27, 1401-04 (1955) September.

There is a need for a less complex and more accurate method of determining dissolved oxygen concentrations in the 0 to 50 parts per billion range. A colorimetric method has been developed employing reduced indigo carmine. The oxygen is estimated either by comparing by eye with artificial color standards, or with a spectrophotometer. Oxygen in concentrations of 0 to 25 p.p.b. can be determined by the eye with an average deviation of 2 p.p.b. The procedure adopted is free of the difficulties of air entrapment, reagent blank, and complicated sampling. It can be used by inexperienced boiler plant personnel to determine dissolved oxygen accurately in boiler feed water, or in precise laboratory determination. Authors' Abstract

Olefin Determination

Long, D. R. and Neuzil, R. W. DETERMINATION OF OLEFINS BY MEANS OF IODINE COMPLEXES. ULTRAVIOLET ABSORPTION METHOD. *Anal. Chem.*, 27, 1110-14 (1955) July.

A method for distinguishing six types of alkyl substituted olefins by means of the ultraviolet spectra of their reversible complexes formed with iodine is described. Aromatics and diolefins interfere. D. V. Kniebes

Organic Sulfur Method

Coope, J. R. and Maingot, G. J. SENSITIVE DETERMINATION OF LOW BOILING ORGANIC SULFUR COMPOUNDS. *Anal. Chem.*, 27, 1478-84 (1955) September.

Improvements in the reduction of disulfide in organic solution permit determinations of 99% accuracy. Direct determination of hydrogen sulfide in the presence of thiol is effected by separating precipitated sulfide from mercaptides by adjustment of acidity. Procedures, suitable especially where homologs of low molecular weight may be present, form a convenient scheme for sensitive determination of hydrogen sulfide and low-boiling thiols and disulfides in gaseous organic mixtures.

Authors' Abstract

Trace Nitrogen in Oils

Noble, E. D. DETERMINATION OF TRACE KJELDAHL NITROGEN IN PETROLEUM STOCKS. *Anal. Chem.*, 27, 1413-16 (1955) September.

The only previously reported method for determining very low levels of total nitrogen in petroleum stocks is unsuited to routine analysis. In this work, a reproducible low blank has been achieved by purification of the Kjeldahl reagents, permitting detection of as little as 1 p.p.m. total nitrogen by Kjeldahl digestion of a 5-gram sample. A systematic study was made of the phenol-sodium hypochlorite colorimetric method of ammonia assay, resulting in improved reliability of this hitherto unpopular method. The procedure lends itself well to multiple analyses. Author's Abstract

8. GENERAL AND PHYSICAL CHEMISTRY

Adsorption in Carbon

Millard, B., Caswell, E. G., Leger, E. E. and Mills, D. R. THE ADSORPTION AND HEATS OF ADSORPTION OF WATER ON SPHERON 6 AND GRAPHON. *J. Phys. Chem.*, 59, 976-78 (1955) September.

Adsorption isotherms and heats of immersion have been measured at 30° for the systems Spheron 6-water and Graphon-water, the Graphon having been heated in hydrogen at 1000° to remove chemisorbed oxygen. Isosteric heats of adsorption, calculated from the isotherm and heats of immersion data, show the heats of adsorption of water on Spheron to be greater than the heat of liquefaction of water, while the heats for Graphon are lower than the heat of liquefaction. Authors' Abstract

Adsorption Reactions

Webb, A. N. and Eischens, R. P. OXYGEN EXCHANGE IN CHEMISORBED CARBON MONOXIDE. *J. Amer. Chem. Soc.*, 77, 4710-13 (1955) September 20.

Experimental work has shown that there is an exchange of oxygen between molecules of carbon monoxide chemisorbed on iron and that the extent of the exchange increases with temperature. At a temperature of —78° C. an exchange of 20 percent of completion was observed while at 160° C. the exchange was almost complete. The presence of gaseous CO increased the extent of the exchange, while O_2 and CO_2 had little effect on the exchange. Evidence is against an exchange mechanism based on dissociation into atoms, or oxygen-rich complexes. The suggested mechanism is a direct exchange between carbon monoxide molecules.

E. J. Pyrcioch

Winter, E. R. S. EXCHANGE REACTIONS OF SOLID OXIDES. PART VI. THE REACTIONS OF CARBON MONOXIDE, CARBON DIOXIDE, AND OXYGEN ON CUPROUS OXIDE, NICKEL OXIDE, AND CHROMIUM OXIDE. J. Chem. Soc. (British), 2726-40 (1955) August.

The reaction $2CO + O_2 \rightarrow 2CO_2$ has been studied by using mainly the stoichiometric mixture of reactants, on NiO, Cr_2O_3, and Cu_2O at pressures of 1 — 9 cm. and temperatures from 10° to 155°. On the first two oxides the reaction proceeds with an apparent E of 5.5 kcal. mole^{-1} and zero respectively, following the rate law

$$dP_{CO2}/dt = kP_{CO}/(P_{CO} + P_{CO2}).$$

By using ^{18}O it has been shown that the reaction probably proceeds on only a small fraction (<2.5%) of the surface oxygen sites by an extraction reaction, the carbon monoxide removing a surface oxygen ion which is rapidly replaced by oxygen from the gas phase: evidence is reviewed which suggests that on these oxides the rate-determining step is the latter. The oxygen exchange of these three gases with the surface oxygen ions is negligible at temperatures of interest in the oxidation studies. The oxidation reaction on Cu_2O (formed on precipitated copper powder) probably proceeds by the same mechanism. Here ready exchange of oxygen occurs between the two oxides of carbon and the surface oxygen ions of the catalyst. The oxidation reaction on Cu_2O has an apparent E of 10 ± 2, and the exchange reactions with carbon monoxide and dioxide have E about 10 and 4 kcal. mole^{-1} respectively. The oxidation proceeds on 10-40% of the surface sites, the proportion increasing with rising reaction temperature. By using both ^{13}C and ^{18}O it has been shown that no exchange of carbon occurs between carbon monoxide and carbon dioxide on the catalyst surface.

Author's Abstract

Distillation Calculations

Edmister, W. C. IMPROVED INTEGRAL TECHNIQUE FOR PETROLEUM DISTILLATION CALCULATIONS. *Ind. Eng. Chem.*, 47, 1685-90 (1955) September.

The recently proposed integral method for making petroleum distillation calculations is developed and illustrated for numerical and graphical solutions to equilibrium flash vaporization, bubble and dew points, and fractional distillation. R. F. Bukacek

Enthalpy-Entropy Diagram

Noeggerath, W. GENERAL ENTHALPY-TEMPERATURE ENTROPY DIAGRAM FOR IDEAL GASES AND GAS MIXTURES UP TO 5000° K. *Jet Propulsion*, 25, 454-60 (1955) September.

On the basis of generalized functions for molar specific heat, a method is described which permits the presentation of the enthalpy and entropy of all bi- and triatomic gases and their mixtures in a general diagram by attributing to each gas two parameters. R. T. Ellington

Hydrogen Diffusion

Juenker, D. W., Van Swaay, M., and Birchenall, C. E. ON THE USE OF PALLADIUM DIFFUSION MEMBRANES FOR THE PURIFICATION OF HYDROGEN. *Rev. Sci. Instr.*, 26, 888 (1955) September.

The effects of temperature and pretreating on the capacity and life of these units is discussed. R. T. Ellington

Molecular Structure

Bragg, L. X-RAYS AND THE MOLECULE. *Chem. and Ind.*, (British) No. 38, 1164-69 (1955) September 17.

A discussion of the uses of X-rays in the interpretation of molecular structure is presented. D. V. Kniebes

Radiation Chemistry

Dorfman, L. M., and Shipko, F. J. THE BETA-PARTICLE RADIOLYSIS OF ACETYLENE. *J. Amer. Chem. Soc.*, 77, 4723-26 (1955) September 20.

The rate of acetylene polymerization, initiated by tritium-beta-particles, was determined at room temperature, and a mechanism explaining the formation of the major products, cuprene and benzene, is presented. Additional runs made with deuteroacetylene-acetylene mixture show that exchange occurs between isotopic acetylene molecules, indicating that carbon-hydrogen bond rupture does occur in radiolysis. E. B. Shultz

Steam-Carbon Kinetics

Pilcher, J. M., Walker, P. L., Jr., and Wright, C. C. KINETIC STUDY OF THE STEAM-CARBON REACTION. INFLUENCE OF TEMPERATURE, PARTIAL PRESSURE OF WATER VAPOR, AND NATURE OF CARBON ON GASIFICATION RATES. *Ind. Eng. Chem.*, Part I, 47, 1742-49 (1955) September.

These steam-carbon reaction studies were made for the temperature range of 1000° to 1450° C.; partial pressures of water vapor ranging from 30.7 to 358 mm. of Hg., and with carbon samples prepared from petroleum coke with coal-tar pitch binder. An activation energy of 40.7 kcal. per mole was determined for the reaction for the temperature range 1000° to 1100° C. an apparent order of reaction of 0,66 was obtained for the rate equation, $R = a P^n$ where R is the rate of reaction in gm per hr, a is an empirical constant, P is the partial pressure of water vapor in mm of Hg and n the order of the reaction. Carbon reactivity was found to decrease as crystallinity of the sample increased. Steam decomposition increased with temperature but was not influenced by the type of carbon. Equilibrium for the water-gas shift reaction was approached at a temperature of 1300° C. E. J. Pyrcioch

Thermal Conductivity

Bonilla, C. F., Tarmy, B. L., and Lee, C. S. THE MEASUREMENT OF THE THERMAL CONDUCTIVITY OF GASES AT HIGH TEMPERATURE. PB 111571, Off. Techn. Services (1954) January 20.

A method is mathematically derived for the measurement of the thermal conductivity of gases which is independent of radiation, and thus particularly suitable at elevated temperatures. The method employs a conventional hot-wire cell with its wire heated by a sinusoidal

alternating current superimposed upon a direct current. The operating conditions under which the radiation introduces no appreciable error are indicated as well as the inherent limitations of the method. Optimum cell design and operating conditions are suggested.

Authors' Abstract

9. ORGANIC CHEMISTRY

Acrylonitrile from Gas

NATURAL GAS TO ACRYLONITRILE. *Oil Gas J.*, 54, 110-13 (1955) September 5.

American Cyanamid's new acrylonitrile plant at Avondale, La. is described. Acetylene is produced by partial combustion of natural gas with oxygen and hydrocyanic acid is produced by reaction of natural gas, ammonia and air over a platinum catalyst. The acetylene and hydrocyanic acid are then converted directly to acrylonitrile. Plant capacity is 50 million lb per year.

H. R. Linden

Ammonia

Eickmeyer, A. G. and Marshall, W. H., Jr. AMMONIA SYNTHESIS—GAS GENERATION BY PRESSURE REFORMING OF NATURAL GAS. *Chem. Eng. Progress*, 51, 418-21 (1955) September.

The advantages of pressure reforming of natural gas in ammonia synthesis is outlined. Savings in heat recovery and compressor horsepower are obtained. These must be balanced against the increased cost of heavier wall alloy reforming tubes in the pressure reformer.

W. G. Bair

HCN Production

McKinnis, A. C. (assigned to Union Oil Co. of California) PRODUCTION OF HYDROGEN CYANIDE. U. S. 2,718,457 (1955) September 20.

In this non-catalytic process, hydrogen cyanide is produced in a tube reactor by reacting air, natural gas and ammonia in a volume ratio of 15:4:1 at temperatures between 1000° C. and 1700° C. with a residence time between 0.02 and 0.06 seconds. The conversion of ammonia to hydrogen cyanide is about 65 percent.

E. J. Pyrcioch

Petrochemical Raw Material

Guthrie, V. B. FOR PETROCHEMICALS—THINGS ARE PICKING UP. *Petroleum Proc.*, 10, 1387-90 (1955) September.

Price rather than volume of supply will continue to be the overall index to whether natural gas or petroleum fractions are selected as raw material for petrochemical manufacture. The present large tonnages of petrochemicals require only about 1% of the total crude oil and natural gas production in the U. S., and not over 3% if the fuel consumed in their manufacture is included. Natural gas as raw material will come under closer scrutiny in the future for two reasons, 1) the upward trend in prices at the wellhead, and 2) the confusion as to the regulation of gas prices caused by the Supreme Court's decision in the Phillips case. The trend in gas prices is already bringing this raw material closer to a competitive base with petroleum. The average wellhead price to gas producers in 1954 was 10.0¢ per MCF., compared with 9.2¢ in 1953, and 6.5¢ in 1950, when many of the present long term gas contracts were written. Present new contracts are being written on the basis of 15¢ in the smaller gas producing fields, where the petrochemical plant payout term will be shorter than in the large gas fields. In the latter, the base for new contracts is said to be around 20¢, close to the point where it may be uneconomic to use gas in the manufacture of chemicals where the price of the raw material is a large proportion of the total manufacturing cost. A well-head price of 25¢ is the point where the conversion of petrochemical plants to petroleum will start in earnest, in the opinion of some authorities.

Author's Extract

Phenol Synthesis

Bewley, T., Bowen, B. E., Bramyche, P. L., Jackson, G. W. (assigned to Hercules Powder Co.) MANUFACTURE OF PHENOL. U. S. 2,715,145 (1955) August 9.

An improved yield of phenol and alpha methyl styrene is claimed from the acid-decomposed isopropyl benzene peroxide process, which is obtained by the usual separation of lighter products by fractionation of the reaction mixture up to 200° C. and the subsequent pyrolysis of the residue (para-alpha-cumyl phenol) between 200° and 400° C.

O. P. Brysch

10. CHEMICAL ENGINEERING

Contacting Plates

Dixon, B. E. and Kiff, P. R. USE OF PERFORATED AND POROUS PLATES IN GAS ABSORPTION. *J. Appl. Chem.*, (British) 5, 391-402 (1955) August.

The performance of perforated and porous plates in achieving contact between gas and liquid in an absorption process is described. A mixture of carbon dioxide and air is passed upwards through a porous disk forming the base of a column containing liquid absorbent and is disseminated throughout the liquid as a mass of bubbles. 30% v/v monoethanolamine is used as absorbent in quantitative tests and the behavior of other liquids is studied qualitatively. A distinction is made between two types of absorption taking place in the column. Absorption at the plate surface is extremely active and is essentially complete within a very small compass. Absorption throughout the remainder of the column is much less efficient per unit space and more akin to that of ordinary absorption towers. The influence of various factors (total gas flow rate, and the number, cross-sectional area, and position of perforations) on 'plate surface' absorption is expressed quantitatively. The absorptive behavior of commercial porous plates broadly follows that of perforated plates but, owing to a less standardised distribution of pores, is not so well defined. The effect on absorption efficiency of change in the flow pattern of the foaming liquor is traced.

Authors' Abstract

Jones, J. B., and Pyle, C. RELATIVE PERFORMANCE OF SIEVE AND BUBBLE-CAP PLATES. *Chem. Eng. Progress*, 51, 424-28 (1955) September.

A comparison of a sieve and a bubble-cap plate fractionating tower was made on a acetic acid-water system at total reflux and atmospheric pressure. Perhaps the most significant difference in the performance of the two plates was the superior plate efficiency exhibited by the sieve. The entrainment characteristics of the sieve and bubble-cap plates exhibited the greatest difference of any of the factors investigated. The sieve plates showed entrainment values only about 20% as great as the bubble-cap plate over all of the normal operating range. To complete the comparison of sieve and bubble-cap plate towers, a cost comparison was obtained for two towers which, except for the type of plates, were identical. The sieve plate tower except for the cost of the shell was about half the cost of the bubble-cap plate tower.

H. A. Dirksen

Material Handling

Rasmussen, G. MATERIAL HANDLING PLANTS FOR GAS WORKS. International Gas Union IGU/16-55, 6th Conference, New York, September 26-30 (1955).

This paper reviews some of the more important coal, coke and bulk conveying and handling equipment as used in European gas works in an attempt to determine the most economical and efficient equipment for particular applications. Handling costs which amount to 15 percent of the gas works operating costs are discussed as regards operator wages, maintenance, power, interest and depreciation. Operating costs for a Copenhagen gas works are given in which the interdependence of handling costs for certain machines on load factor is shown.

E. J. Pyrcioch

Reactor Design

Funk, W. H. IN PRESSURE VESSEL DESIGN WHEN TO USE THE ALLOY STEELS. *Petroleum Processing*, 10, 1365-67 (1955) September.

Four sets of graphs are presented which indicate when it is more economical to use alloy rather than carbon steels. Cost per square foot of shell is plotted against the product of pressure and radius, at 650, 750, 850 and 950° F. Because of their greater strengths and consequent weight savings, cost of the alloy steels will fall below that of carbon steels at some certain point. Ten steels are compared in this study based on the ASME Boiler Code of 1952 and limited to pressures below 800 psi. Additional graphs showing steel thickness and weight per square foot as a function of the pressure-radius product, as well as allowable stresses versus temperature up to 1200° F., are presented.

E. B. Shultz

Vapor-Liquid Equilibria

Kharbanda, O. P. VAPOR-LIQUID EQUILIBRIA FOR PARTIALLY MISCIBLE BINARY SYSTEMS. *Chem. and Process Eng.* (British), 36, 245-47, 250 (1955) July.

A short-cut calculation method is outlined for the determination of vapor-liquid equilibrium in fractional distillation for binary mixtures of partially miscible liquids are concerned. The theory of the method and a practical example are included. B. E. Eakin

Water Pollution

PROGRESS IN WATER-POLLUTION CONTROL. *Chem. and Process Eng.* (British), 36, 271, 278 (1955) July.

This article includes a section describing experimental work conducted in Britain on the treatment of spent liquor and retort house liquor with settled domestic sewage. The work appears inconclusive and further study is being planned. R. F. Bukacek

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Automatic Technology

Weinberg, E. A REVIEW OF AUTOMATIC TECHNOLOGY. Reprint No. 2166 U. S. Department of Labor (1955), February and June.

A general discussion of 1) The Meaning, Outlook, and Implications of Automation, and 2) The Effect of Automation on Industrial Relations is presented. D. V. Kniebes

PROCESS CONTROL ANALYSIS. *Instr. and Autom.*, 28, 1316-18 (1955) August.

Previously the basic differential equations and their analytical solutions have been derived for closed-loop process-control systems. The present (fifth) article discusses the use of an analog computer for analyzing a two-capacity liquid-level system with an ideal controller. The individual as well as the combined effects of proportional, derivative, and integral responses of the controller are shown by the graphical results of the computer. S. Hu

Computers

Walz, R. F. DIGITAL COMPUTERS—GENERAL-PURPOSE AND DDA. *Instruments and Automation*, 28, 1516-22 (1955) September.

There are two classes of digital computers—general-purpose and special-purpose. The digital differential analyzer, or DDA, is a special-purpose computer designed especially for the solution of differential equations. Features, operation, and application of the G-15 General-purpose and the D-12 DDA computers are presented. Author's Abstract

Dew Point

Donsky, A., Naubereit, H., and Paulovich, M. DEW POINT INDICATOR. U. S. 2,714,818 (1955) August 9.

This patent describes a dew-point cell using a mirrored surface for condensation with provision made for contrast between dew formation on part of the mirrored surface and lack of dew on the remainder. R. F. Bukacek

Electronic Flow Meter

Smith, F. C., Jr. METER OF THE FUTURE IS HERE. *Pipe Line Ind.*, 3, 39-41 (1955) July.

An electronic analog computer type flow-meter is described. This unit makes a continuous record of flow rate, and can also integrate the flow rate giving an indication of the total quantity of gas which has passed through the meter. The computer corrects for such variables as base pressure, flowing temperature, compressibility factor, specific gravity, and orifice meter coefficient. Magnetic amplifiers are used throughout, and solid-type transducers are used for sensing devices. B. E. Eakin

Fluidizer Valve

Vickers, H. H. (assigned to Esso Research and Eng. Co.) CONSTRICTION VALVE FOR FLUIDIZED SOLIDS. U. S. 2,716,575 (1955) August 30.

A new type of constriction valve for controlling the flow of fluidized solids is claimed. A rubber lining is placed inside a transfer line section and is opened or closed by external gas pressure. W. G. Bair

Heat Exchangers

Granet, I. HEAT EXCHANGER EXPANSION CALCULATIONS. *Petroleum Refiner*, 34, 101-04 (1955) August.

Semi-empirical equations for heat exchanger expansion are developed for three cases: Boiling, true parallel flow, and true counter current

flow. Extension of the equations to the multi-poss case can be approximated. W. G. Bair

Lubrication, 1954

BEARINGS, LUBRICANTS, AND LUBRICATION. *Mech. Eng.*, 77, 789-801 (1955) September.

A digest of the technical articles appearing in 1954 concerning bearings, lubricants and lubrication. Sections include, journal bearings and bearing material; ball and roller bearings; thrust bearings, automotive lubricants; gear lubrication; properties of lubricants and a bibliography. R. F. Bukacek

12 MATERIALS OF CONSTRUCTION

Alloy Steels

Dolezal, R. SAVING MOLYBDENUM AND OTHER ALLOYS IN HIGH PRESSURE STEAM EQUIPMENT. *Combustion*, 27, 63-66 (1955) September.

This Czech engineer advocates a design philosophy to overcome a lack of critical alloying elements for high temperature steam service. Molybdenum-free steels are used for the section of the tubing where temperature is below 450° C., perlitic steels containing molybdenum are used only for the hottest sections. A mechanical joint of special design is used instead of welding where austenitic and perlitic tubing must be joined. A pressed fit is used, cooled by saturated steam to prevent loosening due to creep, and to prevent diffusion between the steels.

E. B. Shultz

Cathodic Protection

Ham, D. L. DESIGN AND APPLICATION OF CORROSION CURRENT MEASURING INSTRUMENTS. *Corrosion*, 11, 343t-46 (1955) August.

The principle types of instruments used to measure currents and voltages associated with corrosion are described and their circuit diagrams are illustrated. Several examples are given to illustrate the use of power sensitivity criterion for instrument insertion error in making measurements. G. G. Wilson

Peabody, A. W. RECTIFIERS VS. GALVANIC ANODES AND OTHER DETAILS OF CATHODIC PROTECTION. *Gas*, 31, 47-51 (1955) August.

Cost considerations involved in the design of cathodic protection installations utilizing either galvanic anodes or rectifiers are discussed in detail and illustrated by simple calculations.

G. G. Wilson

Coatings

INSIDE OF PIPE AND TUBING COATED BY HORIZONTAL PROCESSING METHOD. *Ind. Heating*, 22, 1643-48 (1955) August.

The article describes the application of an epon-phenolic plastic to the interior of drill pipe to reduce failures caused by corrosion fatigue. The coating is cured by baking at 375° for about ten minutes at the end of a one-hour heat up cycle. R. T. Ellington

Corrosion

LaQue, F. L. ATTENTION TO CORROSION IN THE U.S.A. *Chem. and Ind.* (British), No. 33, 1016-24 (1955) August 13.

A resumé of activities is given in the field of corrosion in the United States including the activities of technical societies such as the Inter-Society Corrosion Committee, American Society for Testing Materials, and the National Association of Corrosion Engineers; of Government agencies such as the Armed Services and the Atomic Energy Commission, of private industry, and of educational institutions. An appendix of pertinent information includes a list of the Technical Committees and organizations. G. G. Wilson

McAmis, J. W. ORGANIZATION AND ACTIVITY OF THE CORROSION CONTROL GROUP OF A LARGE PUBLIC UTILITY. *Corrosion*, 11, 330t-34 (1955) August.

Methods developed by the Washington Gas Light Company to direct their corrosion control activities and to record corrosion control information are discussed and illustrated.

G. G. Wilson

Rudolf, H. J. DESIGN AGAINST ATMOSPHERIC CORROSION. *Corrosion*, 11, 347t-50t (1955) August.

Specific recommendations for construction of metallic surfaces exposed to corrosion are made in regard to selection of structural shapes and practices which minimize the exposed surface area, provide a smooth area of surface, and prevent accumulation of moisture.

G. G. Wilson

Galvanic Corrosion

Compton, K. G., Mendizza, A. and Bradley, W. W. ATMOSPHERIC GALVANIC COUPLE CORROSION. *Corrosion*, 11, 383t-391t (1955) September.

The variations with time of electrode potentials and corrosion currents of galvanic couples consisting of thin sheets of electrode material separated by filter paper saturated with electrolyte are shown graphically. The results of weight-loss studies of bolt- and wire-type galvanic couples exposed to a mine, an industrial, and a severe tropical atmosphere are also presented. G. G. Wilson

High Temperature Metals

Resen, F. L. WHEN REFORMER PIPING FAILED TROUBLE SLEUTHS FOUND OUT WHY—AND ACTED. *Oil Gas J.*, 54, 98, 101, 102, 104 (1955) August 8.

Piping failures on a fixed-bed, cyclic Hydroformer are described, and results of tests on replacement materials after three years' use are discussed. In recycle gas service (53-70 percent hydrogen, 15-22 percent methane, remainder higher paraffin gases) at 850-1050°F., seamless 4-6 Cr, ½ Mo steel pipe had developed a very brittle, thick carburized layer. Other pipes made from carbon-moly steel with Type 410 stainless cladding had numerous cracks in the austenitic (25 Cr, 20 Ni) welds. Some unclad carbon-moly piping showed appreciable spheroidization of the carbide phase. To meet these difficulties, it was decided to replace with 1¼ Cr, ½ Mo steel tubing, since it has higher strength, is non-austenitic (austenitic welds were found to have poor service life), is seamless (most troubles occurred at longitudinal welds) and it has resistance to both carburization and decarburization. After three years, eleven samples were removed and microscopic, macroetch, and welding tests were made, followed by conventional mechanical tests. Only about five percent as much carburization was found. Mechanical properties were excellent. Previous weld difficulties were traced to use of 25 Cr, 20 Ni electrodes which have high expansion coefficients, effects of which were magnified by cyclic operation. Welds with 2 Cr, ½ Mo electrodes gave no such trouble. Similar tests on carbon steel tubes in boiler sercice are discussed. E. B. Shultz

Kiln Insulation

Macdonald, A. C. HOT FACE INSULATION OF INTERMITTENT KILNS. *Fuel Efficiency* (British), 4, 25-26, 29-30 (1955) September.

Reduction of cooling times by 30% and total fuel consumption by 40% is the result of changing the construction of walls round kilns. On the new kilns the walls consist of 9 in. of insulating fire brick, 1 in. of block insulation inside a steel shell while older kilns of the same capacity and standard brick walls are 8 feet greater in outside diameter. R. T. Ellington

Metal Finishes

FINISHES FOR METAL PRODUCTS (MATERIALS AND METHODS MANUAL NO. 119). *Materials and Methods*, 42, 117-32 (1955) September.

A brief description of the properties and uses of various types of finishes currently used for metal products including surface conversion coatings, organic coating, metallic coatings, and inorganic coatings. G. G. Wilson

Plastic Pipe

Jacobson, W. E. METHODS OF JOINING PLASTIC PIPE. *Air Cond., Heatg. and Ventilg.*. 52, 75, 76, 146 (1955) September.

A summary of materials used in plastic pipe is given with illustrations of various regular fittings and special purpose types. Slip-type fittings and flanges for bolted joints are available so that an entire system can be designed with polyethylene. The three groups of fittings used for joining plastic pipe are described as threaded, slip-sleeve, and flanged fittings. A brief discussion is given to other means of joining plastic pipes. (see also Gas Abs. 11, 76 (1955) April. J. R. Hasenberg

Tubing Failure

Texter, H. G. WHY OIL-WELL TUBING AND CASING FAIL. PART II. WHY THEY BURST, LEAK, CRUSH, AND WHY LAST ENGAGED THREAD FAILS. *Oil Gas J.*, 54, 84-91 (1955) August 1.

The second of a series on oil well tubing and casing failures, this article discusses and illustrates a variety of tubing and casing failure types and their causes. R. F. Bukacek

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